Science

Sat, Sep 17, 2005

IRAN DAILY

GO
Advanced Search
PDF Version
Front Page
National
Domestic Economy
Science
Panorama
Economic Focus
Dot Coms
Global Energy
World Politics
Sports
International Economy
Arts & Culture
RSS
Archive

Obese Coronary Artery Patients Can Consider Bariatric Surgery

Mayo Clinic researchers report in the September edition of Mayo Clinic Proceedings that bariatric surgery is a safe option for treating obese patients who have coronary artery disease, according to Brightsurf.

The findings are important because coronary artery disease patients can see a significant benefit with a successful procedure. The resulting weight loss is also followed by an improvement in blood pressure, cholesterol, blood sugar and sleep apnea, all factors linked to coronary artery disease.

“In essence, obese patients with coronary artery disease might be those who need this surgery the most, but get it the least,“ says Francisco Lopez-Jimenez, M.D., Mayo Clinic cardiologist and lead author of the study.

The study is the first report about the safety and efficacy of bariatric surgery in patients with a history of coronary artery disease, the authors say.

“Roux-en-Y bariatric surgery appears to be an important alternative in treating patients with coronary artery disease and obesity who cannot lose weight with standard approaches,“ says Dr. Lopez-Jimenez. “The surgery appears to be safe in properly evaluated patients with cardiovascular disease.“

But Dr. Lopez-Jimenez says additional research is needed to determine the effect of bariatric surgery on cardiovascular events among these patients. The analysis by the Mayo researchers included 52 patients who were identified with coronary artery disease, who underwent bariatric surgery at Mayo Clinic Rochester between March 1995 and January 2002. The effects on body weight and other cardiovascular risk factors were analyzed after surgery. After an average follow-up of 2.5 years with patients, the researchers found significant decreases in weight loss, body mass index and blood pressure. Blood analysis showed decreases in key indicators, as well.

MayoClinic.com notes that coronary artery disease is the most common type of heart disease, affecting about 13 million Americans. The cause of coronary artery disease is atherosclerosis--the gradual buildup of plaque in the arteries that feed the heart.

The failure of conventional techniques to treat severe obesity successfully sparked interest in surgical strategies.

The use of these procedures has gained acceptance and is now considered an option that physicians discuss with their obese patients when other weight loss options have failed.

However, Dr. Lopez-Jimenez said diet and increased physical activity should remain as the initial approach in the treatment of obesity in patients with coronary artery disease. Bariatric surgery should not be considered first for treatment of obese patients with coronary artery disease because of its high cost and the potential risk of long-term complications in the digestive system.

Celestial Atomic Physics

French mathematician Jules Henri PoincarŽ (1854Ð1912) made this observation in his 1908 essay “Science and Method.“ This remarkable insight aptly encapsulates a key feature of nonlinear dynamics.

According to Science News, sensitive dependence on initial conditions is a feature of the motion of three or more bodies that interact gravitationally. In the solar system, objects such as asteroids and comets, can follow chaotic trajectories, abruptly and unpredictably shifting their orbits from time to time. Numerical computations can pin down their paths only up to some finite time. The distant future remains clouded.

These chaotic trajectories are particularly apparent in a three-body system in which the mass of one body is so small that it doesn't influence the motion of the other two bodies. In such a "restricted" three-body system, the motion of the nearly massless object is typically erratic. An asteroid tugged by Jupiter and the sun falls into this category, as does a spacecraft under the influence of Earth and sun.

Intriguingly, the same sort of uncertainty arises in atomic and molecular systems, particularly for the motion of electrons that have been excited to high energies. In effect, these so-called Rydberg electrons "orbit" at large distances from their parent atoms. Indeed, the mathematics describing the motion of gravitationally interacting bodies in space closely parallels the mathematics describing the motion of the smallest particles of atomic and molecular physics. As it happens, the special case of the celestial restricted three-body problem is mathematically analogous to the situation when a hydrogen atom loses its electron (via ionization) in crossed electric and magnetic fields.

In celestial mechanics, understanding the nature of chaotic trajectories is important for predicting what could happen to populations of small celestial bodies, such as near-Earth asteroids that could threaten the planet, and for designing gravitationally assisted transport of spacecraft. In the case of spacecraft, the tangle of gravitational forces creates tubular "highways" in space along which these vehicles can proceed with little expenditure of energy.

Roughly speaking, transition states are barriers the must be crossed, from starting materials to products, for chemical reactions to occur. Understanding the geometry of these multidimensional barriers provides insights into how chemical reactions occur.

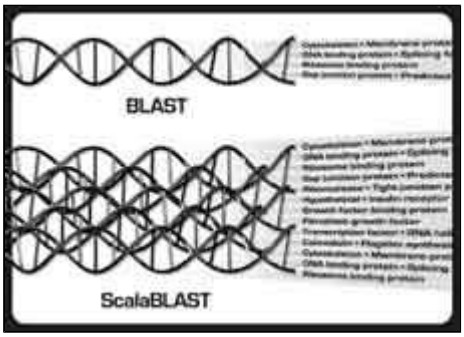
So, using the paraphernalia of the theory, researchers can describe how a set of "reactants" evolves into a set of "products."

The same sort of transition occurs in the celestial realm. For example, the comet Oterma switches, every once in a while, from a complex trajectory outside the orbit of Jupiter to one lying within Jupiter's orbit.

To make this transition, the comet must pass through a bottleneck near two of Jupiter's libration points--points in space where objects maintain a fixed distance relative to the planet and the sun.

Genomic Sequences Processed in Minutes

A new computational tool developed at the Department of Energy's Pacific Northwest National Laboratory is speeding up our understanding of the machinery of life--bringing us one step closer to curing diseases, finding safer ways to clean the environment and protecting the country against biological threats.



ScalaBLAST is a sophisticated "sequence alignment tool" that can divide the work of analyzing biological data into manageable fragments so large data sets can run on many processors simultaneously.

ScalaBLAST is a sophisticated "sequence alignment tool" that can divide the work of analyzing biological data into manageable fragments so large data sets can run on many processors simultaneously. The technology means large-scale problems--such as the analysis of an organism--can be solved in minutes, rather than weeks, sciencedaily.com reported.

In the world of high-end computing, researchers assemble systems composed of many processors. For example, PNNL's supercomputer has 1,960 processors--a big machine with lots of memory and the ability to tackle large problems. However, without special modifications, software doesn't run any faster

on it than it would on a personal computer. In order to get answers to complicated biological questions more quickly, PNNL researchers "parallelized" the software using Global Arrays, a powerful programming toolkit, by creating algorithms to divvy up the work.
PNNL researchers say ScalaBLAST may be used to process complex genomic sequences, work that is essential to understanding the building blocks of the genome--or rather, how they work and fit together. Genomes represent an organism's entire DNA, including its genes. When the gene's sequences are analyzed they can provide clues to diseases and possible treatments.
Using ScalaBLAST, researchers can manage the large influx of data resulting from new questions that arise during human genome research. Prior to this new tool, it took researchers 10 days to analyze one organism. Now, researchers can analyze 13 organisms within nine hours, making the time-to-solution hundreds of times faster.
"Access to and understanding the pieces of genome sequences will allow researchers to understand the body's cellular machinery and discover clues to some types of cancer. And it will help in developing drugs or detection methods to be used for particular diseases," said T.P. Straatsma, a PNNL senior research scientist.
And it likely will help in other areas of human health. It's fair to say that, in the realm of human health and disease, if you can solve a problem in one area, you can often solve it in others--that's the nature of human biology," Straatsma said.
Having the ability to process large data sets with this computational tool can also provide new insight into how microorganisms can process toxic pollutants through processes like bioremediation.
It also can help understand the components of biological systems, leading to better detection methods for homeland security purposes and making it possible to more quickly identify and respond to threats or develop biological countermeasures.

Exercise, Healthy Diet Slow Memory Loss

An active lifestyle and a healthy, fish-rich diet are not only good for your heart, they may also help tackle the memory loss associated with old age, two leading neuroscientists said.
According to Reuters, as people live longer, finding ways of halting the decline in mental agility is becoming increasingly important, said Professor Ian Robertson, director of the Institute of Neuroscience at Trinity College Dublin.
"The biggest threat to being able to function well and properly is our brains," he told journalists at the British Association for the Advancement of Science meeting in Dublin.
"There is very strong evidence, particularly in the over-50s, that the degree to which you maintain your mental faculties depends on a handful of quite simple environmental factors," he said, having identified seven key areas.
Those who remained physically fit, avoided high stress levels and enjoyed a rich and varied social life are better equipped to stay alert as they age. Mental stimulation, learning new things and simply thinking young also help.
A new survey compiled for the University of Kent and the charity Age Concern showed ageism was rife in Britain where people, on average, see youth as ending at 49 and old age beginning at 65.
But Robertson said such attitudes were not helpful given the number of 80-year-olds who remain "sharp as pins."
"If you start to think of yourself as old when you are 60, which is no longer justified, you will behave old," he said.
Research conducted by his Trinity College colleague Professor Marina Lynch showed healthy eating was another key requirement for staying on the ball, according to Robertson.
Lynch said new research showed fish oils may reduce the cell inflammation that triggers a decline in memory.
"Studies have identified the anti-inflammatory properties as well as the restorative qualities of omega-3," she said of the essential fatty acid found in supplements like cod liver oil and fatty fish such as mackerel, salmon and tuna.

Treat Cancer With RNA Nanotechnology

Using strands of genetic material, Purdue University scientists have constructed tiny delivery vehicles that can carry anticancer therapeutic agents directly to infected cells, offering a potential wealth of new treatments for chronic diseases, according to NewsWise.
The vehicles look nothing like delivery trucks, though that is their function once inside the body. Instead, these so-called nanoparticles, which are assembled from three short pieces of ribonucleic acid,

resemble miniature triangles.
The microscopic particles possess both the right size to gain entry into cells and also the right structure to carry other therapeutic strands of RNA inside with them, where they are able to halt viral growth or cancer's progress. The team has already tested the nanoparticles successfully against cancer growth in mice and lab-grown human cells.
"RNA has immense promise as a therapeutic agent against cancer, but until now we have not had an efficient system to bring multiple therapeutic agents directly into specific cancer cells where they can perform different tasks," said research team leader Peixuan Guo.
Guo's team created their nanoparticles by linking together different kinds of RNA, a task that their previous research has given them ample opportunities to practice. Several years after building a tiny "motor" from several strands of RNA that mimic those in a bacteria-killing virus called phi29, the team learned how to manipulate these stringy molecules into different shapes, including rods, triangles and arrays.
RNA molecules come in many variant forms, and the sort that the team mimicked from the phi29 virus - called pRNA - also can be linked to other types of RNA to form longer, hybrid strands with properties the researchers could assign.
To accomplish these tasks, the team turned to other forms of RNA that can interfere with the goings-on inside cells. The team sorted through a variety of RNA forms that have shown promise for disease treatment and found three that could perform each of the desired tasks. One example is "small interfering RNA," or siRNA, which deactivates certain genes in cells. The others are RNA aptamers, which bind to cancer cell surface markers, and ribozymes, which can be designed to degrade specific RNA in cancer cells or viruses.
Particles larger than about 100 nanometers are generally too large to pass through cell membranes into the cell's interior, Guo said, and the body has a hard time retaining particles smaller than 10 nanometers. But the tiny triangles fit, and they worked well enough to interrupt the growth of human breast cancer cells and leukemia model lymphocytes in laboratory experiments.
Additionally, the team found that the nanoparticles completely block cancer development in living mice. A group of mice that were in the process of developing cancer were tested with the nanoparticles, and they did not develop the disease. A second group that was tested with mutated inactive RNA all developed tumors.
Stability of the RNA also is a factor the team must consider. Although they previously published data indicating that phi29 RNA nanoparticles are more stable than other RNA, Guo said the team still needs to find better ways to protect the RNA from degradation by enzymes in the body.

A Giant Surprise
Planet-Bearing Stars
More Metal-Poor Than Others

Giant stars with planets often have smaller amounts of heavy elements than the Sun, say astronomers in the United States and Germany. This trend is surprising: It is opposite the one seen in planet-bearing main sequence stars and suggests stars more massive than the Sun may give birth to planets in a different way.
According to astronomy.com, astronomers discovered the first extrasolar planet around a Sun-like star, 51 Pegasi, 10 years ago. From the first, they noticed most planet-bearing stars are quite metal-rich, containing large quantities of elements heavier than hydrogen and helium. For example, 51 Pegasi's metallicity is 60-percent greater than the Sun's. This trend makes sense: Planets have metals, so they form most easily around metal-rich stars.
Now, however, Simon Schuler of Clemson University and his colleagues say giant stars obey a different rule. The astronomers scrutinized a planet-bearing orange K-type giant named HD 13189. This star is similar to Arcturus but located thousands of light-years away in the constellation Triangulum. Schuler's team found HD 13189's metallicity is only 26-percent of the Sun's.
Schuler and his colleagues then looked at metallicities astronomers have measured in other planet-bearing giant stars. For example, a Japanese team led by Kozo Sadakane at Osaka Kyoika University recently observed four such stars, noting their metallicities might differ from planet-bearing main sequence stars.
Altogether, only seven planet-bearing giant stars are known. Schuler and his colleagues say four of these seven stars are more metal-poor than the Sun. Furthermore, all seven are more metal-poor than most planet-bearing main sequence stars, whose mean metallicity is 35-percent greater than the Sun's.

| Front Page | National | Domestic Economy | Science | Panorama | Economic Focus | Dot Coms |
| Global Energy | World Politics | Sports | International Economy | Arts & Culture |

| Identification | Search | RSS | Archive |

Contact us: iran-daily@iran-daily.com